26.

43.

Jan 25-9:29 AM

9.3 Taylor series with remainder

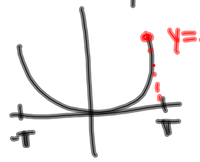
What is the fifth order Maclaurin series for f(x)=sin(x)? What is the maximum error when approximating sin(x) on $[-\pi, \pi]$

Solve graphically and numerically

$$\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} + \text{error}$$

remainder

$$\text{error} = \left| \sin x - \left(x - \frac{x^3}{3!} + \frac{x^5}{5!}\right) \right|$$



Jan 31-5:30 PM

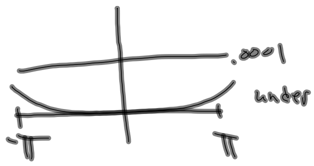
1. order of polynomial (# terms)
2. interval
3. max error

Jan 25-10:04 AM

How many terms are needed in the Maclaurin series for sin(x) in order to approximate sin(x) within .0001 on the interval $[-\pi, \pi]$

max error

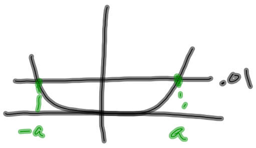
guess & check until error is under .0001



Jan 31-6:00 PM

On what interval does the third order Maclaurin series approximate sin(x) within .01?

$$\text{error} = \left| \sin x - \left(x - \frac{x^3}{3!}\right) \right|$$



use intersect

Jan 31-6:02 PM

Taylor's Remainder Estimation Theorem

$$f(x) \approx f(0) + f'(0)x + \frac{f''(0)}{2}x^2 \dots \frac{f^{n}(0)}{n!}x^n$$

$$\text{error} \le \left| M \frac{x^{n+1}}{(n+1)!} \right|$$

M = max value of $f^{n+1}(x)$

Jan 31-6:03 PM

The approximation $\ln(1+x) \approx x - \frac{x^2}{2}$ is used when x is small.

Use the Remainder Estimation Theorem to get a bound for the maximum error when $|x| \le .01$. Support the answer graphically.

Ex 5

$$\epsilon \le \left| M \frac{x^3}{3} \right|$$

$$f'''(x) = \frac{2}{(1+x)^3}$$

M = max of $f'''(x)$ on $[-.01, .01]$

Jan 31-6:07 PM